

**IN THE UNITED STATES DISTRICT COURT  
FOR THE EASTERN DISTRICT OF MICHIGAN**

**Finisar Corporation,**

**Plaintiff,**

**v.**

**Cheetah Omni, LLC,**

**Defendant.**

**Civil Action No. 2:11-cv-15625**

**DECLARATION OF ERIC A. SWANSON IN SUPPORT OF  
PLAINTIFF FINISAR CORPORATION'S MOTION FOR LEAVE TO FILE A  
SUMMARY JUDGMENT MOTION**

I, Eric A. Swanson, declare as follows:

1. I have been retained as an independent expert by Quinn Emanuel Urquhart and Sullivan, LLP, on behalf of Finisar Corporation ("Finisar"), in connection with the above-captioned litigation with Cheetah Omni, LLC ("Cheetah") concerning U.S. Patent No. 6,888,661 (the "'661 Patent") and U.S. Patent No. 6,847,479 (the "'479 Patent") that are also asserted against Finisar's customers in the Texas Action, and two other two patents, U.S. Patent Nos. 6,445,502 (the "'502 Patent") and 6,721,473 (the "'473 Patent") that are related to the '479 Patent. The '479 patent, the '502 patent, and the '473 patent are all directed to the same feature of an optical device, the variable blazed grating ("VBG") and are herein collectively referred to as the "VBG Patents" and analyzed together for reasons discussed below.

2. I respectfully submit this Declaration in support of Finisar's Motion for Leave to File a Summary Judgment Motion. If called upon as a witness, I could competently testify to the truth of each statement herein.

**A. PROFESSIONAL BACKGROUND**

3. I have over 25 years of experience in the fields of optical communications and optics. I am a Fellow of the Optical Society of America and a Senior Member of the Institute of Electrical and Electronic Engineers. I am an author of more than 75 journal articles and more than 110 conference presentations in the optical communications and optics fields. I am also an inventor of more than 30 U.S. patents and patent applications in the optical communications and optics fields.

4. I am currently a Director for two companies in the optical communications and optics fields, Acacia Communications and NinePoint Medical Incorporated, a research associate at the Massachusetts Institute of Technology, a consultant for Draper Laboratory, a consultant for several venture capital firms, and an occasional consultant to the U.S. Government on various matters relating to communications and optics.

5. I received a Bachelor of Science degree in Electrical Engineering, Departmental Honors Program from the University of Massachusetts at Amherst, Summa Cum Laude in 1982 and a Master of Science degree in Electrical Engineering at the Massachusetts Institute of Technology with a 5.0/5.0 GPA in 1984.

6. Some of my professional accomplishments over the last 25 years include being founder and Chief Scientist of Sycamore Networks, which went public in 1999 with a \$14B IPO, being Founder and CTO of Lightlab Imaging, which was acquired by St. Jude Medical for \$100M in 2010, and being founder of Advanced Ophthalmic Devices Incorporated, which was acquired by Zeiss Meditec in 1994, and which has since shipped over \$1B of products that treat over 10 million people a year for various eye diseases. A copy of my CV describing my

education and experience is attached hereto at **Exhibit A**.

**B. STANDARDS FOR CLAIM CONSTRUCTION AND PATENT INFRINGEMENT**

7. I am not a legal expert and offer no opinions of the law. However, I have been informed by counsel of the legal standards that apply with respect to claim construction and patent infringement.

8. It is my understanding that when construing claims, one must first consider the intrinsic evidence, which includes the claim language, the specification and the prosecution history of the Cheetah Omni patents.

9. In particular, I understand that one must first consider the words of the claims themselves, giving those words their customary and ordinary meaning as understood by one skilled in the art, unless the patent specification or prosecution history clearly states a special meaning. After reviewing the text of the claims, one must then consider the specification to determine whether the inventor has employed any terms or words in a manner that is inconsistent with their ordinary meaning or has set forth a special meaning. In addition to the claims and the specification, one must review the patent's prosecution history, which is the complete record of all the proceedings before the Patent and Trademark Office, including any express representations made by the applicant regarding the scope of the claims.

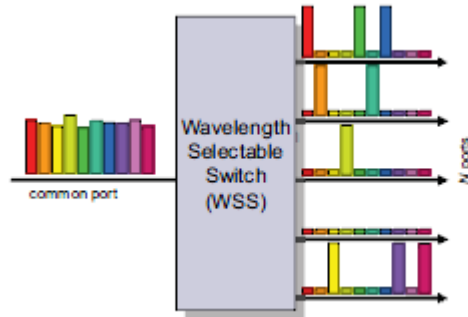
10. I also understand that one may also consider extrinsic evidence to ensure that a claim construction is not inconsistent with clearly expressed and widely held understandings in the pertinent technical field. Such extrinsic evidence may take the form of technical treatises, articles, dictionaries, and expert and/or inventor testimony. I further understand that one may not rely on extrinsic evidence to contradict or vary the meaning of claims provided by the intrinsic evidence of record.

11. I understand that claims are to be construed from the perspective of one of ordinary skill in the art at the time the alleged invention was made. I understand that factors such as the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, prior art solutions to those problems, and the speed at which innovations are made, may help establish the level of skill in the art. It is my opinion that a person of ordinary skill in the field of the Cheetah Omni patents would have at least a Master's Degree in Electrical Engineering, Physics or Optics, or an equivalent field of study and at least 2 years of experience designing or building optical communications components or systems.

12. I understand that a person infringes a patent directly by making, using, selling, or offering for sale in the United States a product or method that embodies the patented invention. It is my understanding that every claim limitation is essential in proving infringement, and the absence of even one limitation in an accused product or process avoids infringement. I further understand that a claim limitation is literally met if it is found in the accused product or process exactly as it is recited in the claim.

### **C. OVERVIEW OF FINISAR ACCUSED PRODUCTS**

13. A Wavelength Selective Switch (WSS) device is a key component in modern so-called "Dense Wavelength Division Multiplexing (DWDM)" optical communications systems. Dense Wavelength Division Multiplexing (DWDM) is a technology which multiplexes (i.e., combines and directs) a number of different wavelengths (*i.e.*, different colors) onto a single optical fiber. WSS devices perform functions which allow DWDM optical communications systems to be easily reconfigured automatically or by a remote operator so that channels can be routed to most efficiently carry data traffic as data demand changes. The high level functionality of WSS devices is illustrated in the below diagram.



14. The common port at the input of the WSS (on the left side of the diagram) receives a multi-channel (i.e., “multiplexed”) signal where each channel comprises a separate wavelength, which is shown as a different color. The WSS device routes the various wavelengths received at the common port to any of the N output ports (i.e., performs a so-called “switching” function based on the wavelength of the signal). The WSS device can also be used in the opposite direction to combine channels at the N output ports onto the common port. Finisar's devices also have the capability of varying the bandwidth of the channels to allow different amounts of data to be efficiently transported in each channel. In addition, WSS devices have the ability to independently attenuate individual wavelengths (signals) in order to equalize the optical power in each of the channels, which is desirable for many optical communications systems. Finisar manufactures several products that include WSS devices (“Finisar WSS Products”).<sup>1</sup>

#### **D. SUMMARY OF OPINIONS**

15. With respect to the ‘661 Patent, it is my opinion that a person of ordinary skill in the art would construe the phrase “cavity” based on an explicit definition set forth in the specification. In particular, the claimed “cavity” requires a pair of reflective surfaces (stacks) which would be interpreted in the context of the patent as “partially transmitting dielectric

<sup>1</sup> Finisar manufactures several WSS-based products including the Dynamic Wavelength Processor (DWP), the Edge Wavelength Processor (EWP), and the WaveShaper Programmable Optical Processor. See **Exhibit F** (WSS ROADM Product Guide) and **Exhibit G** (WaveShaper Programmable Optical Processors).

mirrors having alternating layers of higher index dielectric materials and lower index dielectric materials.”

16. Based upon the explicit definition set forth in the specification, it is my opinion that the Finisar WSS Products do not infringe the ‘661 Patent because they do not include the required “cavity,” let alone a “plurality of cavities” as required by the asserted claims in the patent.

17. With respect to the VBG Patents, it is my opinion that a person of ordinary skill in the art would construe the phrase “variable blazed grating” according to its ordinary and customary usage in the field of optics and optical communications. In particular, a person of ordinary skill in the art would interpret the term “grating” in the context of the VBG Patents as a “device having a large number of parallel grooves, slits or strips used to produce dispersed optical spectra by diffraction of light.” The phrase “blazed” grating refers to a specific type of grating that includes grooves, slits or strips that have been blazed at a blaze angle  $\theta_B$ . In addition, a “variable” blazed grating requires that a grating rotate its grooves, slits or strips to form a variable blaze angle  $\theta$ .

18. Based upon the ordinary and customary meaning of “variable blazed grating,” it is my opinion that the Finisar WSS Products do not infringe any of the VBG Patents because the accused LCoS component of the Finisar WSS Products do not include a grating that is “blazed” and also that is “variable,” as taught by the Cheetah VBG Patents.

**E. The ‘661 Patent**

**i) Overview**

19. Cheetah’s ‘661 Patent is directed to a particular type of “tunable optical device” that communicates “desired wavelengths of light by selectively changing the response of the

device to the wavelength selected for communication.” ‘661 Patent (**Exhibit B**) at col. 1, lines 11-14. In one embodiment, the “tunable optical device” is an optical filter that allows only a particular range of wavelengths (or colors) of light to transmit through the device. *Id.* at col. 1:30-60. The device is “tunable” to the particular wavelength (or color ) of light by application of an electric field.

20. The “tunable optical device” described in the ‘661 Patent is constructed in a particular way to achieve its stated objective of being “tunable” to a particular wavelength (or color). Specifically, the device includes (1) a “plurality of cavities each comprising electro-optic material,” (2) the electro-optical material having an “optical characteristic capable of being manipulated by application of an electric field” and (3) “wherein at least some of the plurality of cavities are coherently coupled to others of the plurality.” *Id.* at col. 1:32-42. The device includes a “sufficient number of cavities to result in an approximately square frequency response for the device.” *Id.* at col. 1:34-36. The reference to an “approximately square frequency response for the device” refers to the ability of the device to allow only a select wavelength range of light to transmit through the device while attenuating other wavelengths. A square frequency response has been traditionally considered to be an ideal filter response for adding and dropping wavelengths because this filter response is most efficient in that it does not waste any wavelengths.

**ii) Asserted Claims of the ‘661 Patent**

21. It is my understanding that Cheetah has asserted two independent claims and seventeen dependent claims against Finisar’s devices. The asserted independent claims are claims 1 and 48. The asserted claims which depend from claim 1 are claims 2, 6-8, 11, 15, 25-27 and 29-31. The asserted claims which depend from claim 48 are claims 49-50, 52, 55 and 56.

All the asserted claims are hereinafter referred to as the “Asserted Claims.” Claim 1 is representative of the asserted independent claims and recites:

“1. A tunable optical device comprising a plurality of cavities each comprising an electro-material, the electro-optical material comprising an optical characteristic capable of being manipulated by application of an electric field; wherein at least some of the plurality of cavities are physically coupled to others of the plurality of cavities; and wherein the plurality of cavities comprise a sufficient number of cavities to result in an approximately square frequency response for the device, the approximately square frequency response comprising a frequency response with a - 1 decibel bandwidth of no less than 20 GHZ.”

22. There is at least one limitation of the Asserted Claims that is missing from the Finisar WSS Products, as discussed further below. This limitation is: (1) an optical device comprising a “plurality of cavities.” See claims 1 and 48. The interpretation (scope) of this limitation is discussed below.

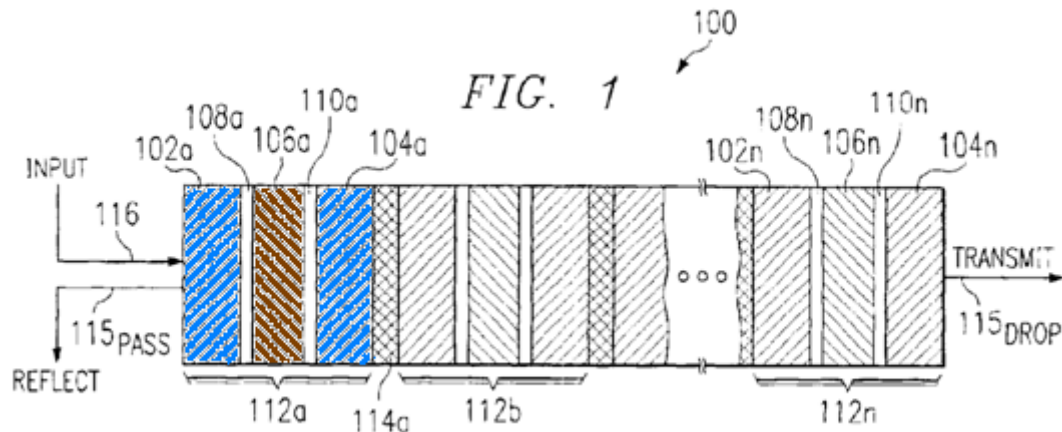
**iii) ‘661 Patent: Interpretation of “Cavity”**

23. The Asserted Claims of the ‘661 Patent each require a plurality of “cavities.” The ‘661 Patent specification expressly defines the term “optical cavity”: “As used throughout this document the term ‘optical cavity’ refers merely to the stratum between reflective stacks, which may comprise a dielectric material, another material, a gas, or a combination of a dielectric material, other materials, and/or a gas.” Id. at col. 4:55-59.

24. The term “reflective stack” used in the explicit definition of “optical cavity” is described in the specification as comprising a “partially transmitting dielectric mirror having

alternating layers of higher index dielectric materials and lower index dielectric materials.” Id. at col. 4:45-47.

25. Figure 1 of the specification of the ‘661 Patent illustrates “one example of a tunable multiple-cavity device” (Id. at col. 3:60-61):



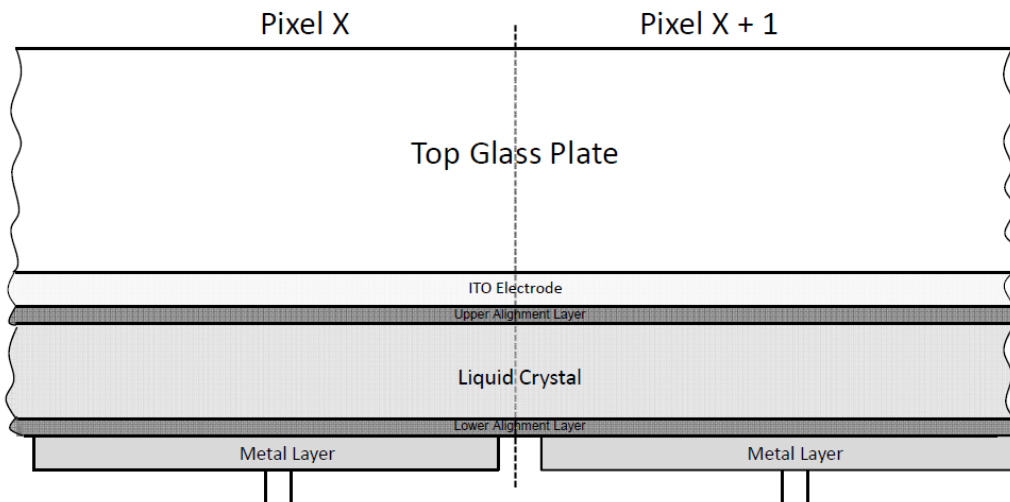
26. Multiple-cavity device 100 illustrated in FIG. 1 includes a “plurality of adjacent fundamental stacks 112a-112n indicated in the figure above where each fundamental stack is operable to selectively communicate all or a portion of a desired wavelength or range of wavelengths of light.” Id. at col. 4:40-42. Each fundamental stack 112 further comprises an optical cavity 106, which is shown in brown in the figure above, formed between reflective stack 102 and reflective stack 104. Reflective stacks 102 and 104 are illustrated in blue in the figure above. Based on how the terms are used in the specification, the terms “cavity” and “optical cavity” are used interchangeably. See, e.g., col. 2:14 (referring to the “cavity” of line 1 as an “optical cavity”); claim 43 (referring to the claimed “cavity” as an “optical cavity”); claim 50 (referring to the “cavity” of claim 48 as an “optical cavity”); and col. 4:37-col. 5:7 (generally). In light of the above, a person of ordinary skill in the art would interpret the phrases “cavity” and “optical cavity” based on the explicit definition set forth in the specification of the ‘661 patent.

Accordingly, based on that definition, a “cavity” (or equivalently an “optical cavity”) requires a pair of reflective surfaces (stacks) which would be interpreted in the context of the ‘661 patent as “partially transmitting dielectric mirrors having alternating layers of higher index dielectric materials and lower dielectric materials.” Id. at col. 4:45-47.

**iv) Finisar’s Accused Wavelength Selective Switch (“WSS”)**

27. I am familiar with Finisar’s WSS Products based on Liquid Crystal on Silicon (LCoS) technology (hereinafter “Finisar’s Accused LCoS Technology”).

28. Finisar’s WSS Products use Finisar’s Accused LCoS Technology. Below is a diagram illustrating two sample “pixels” of a Finisar LCoS device. A pixel is a unit of area over which an electrical potential (voltage) is applied to liquid crystal material by the LCoS device. A different voltage can be applied to each pixel area.



29. The Liquid Crystal material is a volume of liquid about 5-10 microns thick positioned in a continuous void (that extends over the entire active area of the LCoS device. There are no physical partitions separating the liquid crystal material. A gasket is used to

prevents the liquid crystal material from leaking out of the sides of the LCoS device. A Top Glass Plate is used to prevent the liquid crystal material from leaking out of the top of the device and to provide rigidity. The Top Glass Plate is transparent to light entering and leaving the LCoS device. An Indium Tin Oxide (ITO) Electrode (second layer from the top) is deposited on the bottom surface of the glass plate. The ITO Electrode is a conductive oxide that is also transparent to light entering and leaving the LCoS device. The ITO Electrode provides an electrical contact to the top of the Liquid Crystal material. Great care is typically taken to eliminate reflections from the Top Glass Plate and from the ITO Electrode. An Upper Alignment Layer is applied to the bottom surface of the ITO Electrode. A Lower Alignment Layer is applied to the top surface of the Metal Layer underneath the Liquid Crystal material. The Alignment Layers are a polymer-based material that is used to cause the optic axis of the liquid crystals to be the same throughout the Liquid Crystal material. The Alignment Layers are also transparent to light entering and leaving the LCoS device. The Metal Layer is positioned below the Lower Alignment Layer. The Metal Layer is a reflecting metal that is designed to reflect essentially all of the light passing down through the Liquid Crystal material back through Liquid Crystal material and out of the LCoS device.

v) **Non-Infringement of the ‘661 Patent**

30. The void containing the Liquid Crystal material in the above diagram is not a “cavity,” as expressly defined by the ‘661 Patent because it is not positioned “between reflective surfaces (stacks),” as required by the ‘661 Patent. Referring to the materials positioned above the Liquid Crystal material, the combination of the Top Glass Plate, ITO Electrode and Upper Alignment Layer do not form a “reflective stack” because they are not a “partially transmitting . . . mirror” as required by the ‘661 Patent at Col. 5:44-46. In fact, the combination of the Top

Glass Plate, ITO Electrode and Upper Alignment Layer do not form a mirror at all. Instead, the Top Glass Plate, ITO Electrode and Upper Alignment Layer are specifically designed to not reflect the incident optical communication signals (light), otherwise the device would not operate as designed. One skilled in the art would understand that the combination of the Top Glass Plate, ITO Electrode and Upper Alignment Layer are designed to be completely transmissive to the light beams entering and leaving the LCoS pixels and that great care is typically taken to eliminate reflections from these materials.

31. With respect to the materials positioned below the Liquid Crystal material, the Lower Alignment Layer and Metal Layer also do not form a “reflective surface (stack)” because these layers do not form a “partially transmitting . . . mirror” as required by the ‘661 Patent at Col. 5:44-46. These layers are designed to provide a reflecting surface that completely reflects all of the light passing back through and out of the liquid crystal material. Essentially no light passes through the Metal Layer. One skilled in the art would understand that the Lower Alignment Layer and Metal Layer are designed to be completely reflective to light beams propagating through the LCoS pixels and that great care is typically taken to have essentially all of the light passing through the Liquid Crystal material comprising the pixels reflect back into the LCoS pixels and out of the device.

32. Accordingly, neither the top nor bottom surfaces of the Liquid Crystal material provide the necessary “reflective stacks” to allow the device to form the required optical cavity and operate as set forth in the asserted claims.

33. Additionally, even assuming that the region in which the Liquid Crystal material was placed in a “cavity” as defined by the ‘661 Patent (which it is not), there is only one of it in any of the Finisar WSS Products. While the layers illustrated above are virtually divided into

square “pixels,” there is actually no physical division, separation, or coupling. Both regions incasing the area filled with liquid crystal, as well as the Liquid Crystal material itself, are continuous to the outer limits of the LCoS device used in the Finisar WSS Products where they are physically contained by a gasket. In addition, Finisar’s Accused LCoS Technology is specifically engineered so that light from various sections of the LCoS device does not interact with light from other sections within the LCoS device via additional reflections. Any such light interactions will have detrimental effects, such as contributing to optical loss and optical cross talk. Therefore, the Finisar LCoS Technology does not infringe the ‘661 Asserted Claims also because it lacks “a plurality of cavities.”

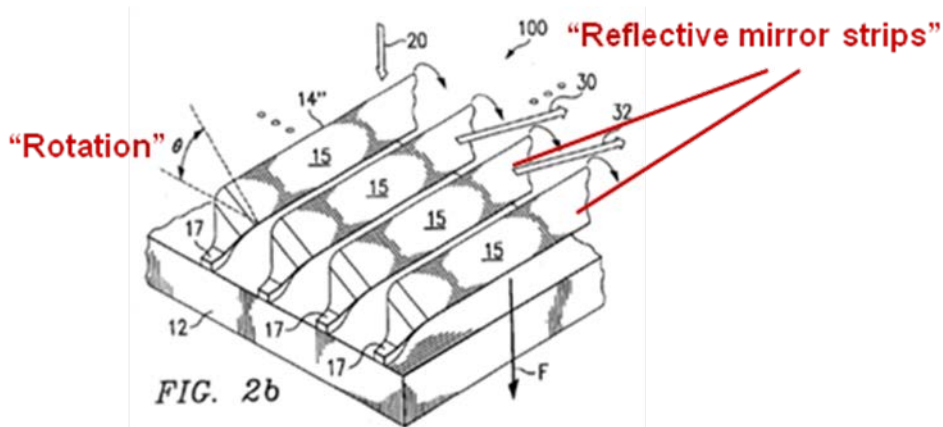
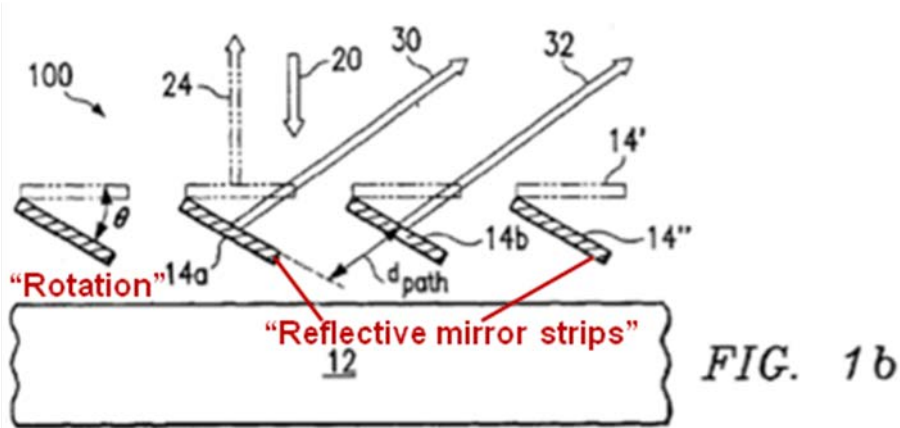
34. In summary, Finisar’s Accused LCoS Technology does not include any of the required “reflective surfaces (stacks)” and, therefore, does not include the claimed “cavities.” In fact, Finisar’s Accused LCoS Technology is specifically engineered to avoid cavity effects, such as the formation of multiple reflections that establish cavity modes because such reflections would be detrimental to the operation of the Finisar WSS Products in that it would result in undesirable optical loss and optical cross talk between optical channel.

## **F. The VBG Patents**

### **i) Overview of the VBG Patents**

35. The VBG Patents are all directed to a device or a method for processing optical signals (light beams) by having narrow (no more than 40 microns wide) rotatable strips of reflective mirrors that can diffract the optical signal at an optimal angle as a result of the rotation of the strips. See ‘479 Patent (**Exhibit C**); ‘502 Patent (**Exhibit D**); ‘473 Patent (**Exhibit E**). All three VBG Patents refer to these rotatable strips as a “variable blazed grating” (“VBG”). Each of the VBG Patents includes the following figures illustrating how the rotatable “reflective

mirror strips” (annotated in text in the figures below) diffract optical signals upon rotation of the strips:



‘479 Patent, Figs. 1b & 2b; ‘502 Patent, Figs. 1b & 2b; ‘473 Patent, Figs. 1b & 2b. Each of the VBG Patents describes the operation of the claimed device and method, depicted in Figure 1b above, as follows:

[S]trips **14** receive optical input beam **20** at an angle normal to the surface of the strips **14** at position **14'**. Strips **14** at position **14'** (shown in dotted lines) show apparatus **100** operating in “reflection mode,” where strips **14** operate to reflect input optical beam **20** as

reflected signal **24**. In this case, because input beam **20** is oriented normally to the surfaces of the strips **14**, reflected beam **24** is communicated back in the same direction from which input beam **20** originated. . . .

Strips at positions **14''** (shown in solid lines) depict strips **14** during a second mode of operation, “diffraction mode.” In diffraction mode, strips **14** are each rotated by approximately a blaze angle THETA from the original position of strips **14**. In a particular embodiment, strips **14** can obtain a maximum blaze angle that is greater than two degrees. Implementing a design that facilitates a wide range of strip **45** rotation provides significant advantages over other approaches by, for example, providing flexibility in system configuration. Input optical beam **20** impinges on surfaces **15** of strips **14**. In this example, a first portion of input optical beam **20** impinges on strip **14a**, while a second **50** portion of beam **20** impinges on strip **14b**, which is adjacent to strip **14a**. While beam **20** may experience some scattering, because of the rotation of strips **14** to position **14''**, the majority of the diffracted portions of input beam **20** are directed in one direction, as illustrated (at least in part) by **55** output rays **30** and **32**.

‘479 Patent, col. 5:28-56; ‘502 Patent, col. 5:28-56; ‘473 Patent, col. 6:20-48.

ii) **Asserted Claims of the VBG Patents**

36. It is my understanding that Cheetah has asserted claims 13-15, 17-18, 20, 23, and 25-27 of the ‘479 patent (the “‘479 Asserted Claims”) implicating Finisar’s Accused LCoS Technology against Finisar’s customers in the Texas Action and that the other two VBG Patents have not been asserted in the Texas Action.

37. Each ‘479 Asserted Claim as well as each claim of the ‘473 Patent includes the “variable blazed grating” limitation. The claims in the ‘502 Patent include limitations equivalent to “variable blazed grating.” Each claim in the ‘502 Patent requires, with slight variations in language, “a plurality of at least partially reflective mirror strips,” which are “operable to undergo a partial rotation” “resulting in a diffraction of the input optical signal wherein a majority of the diffracted input signal is communicated in one direction.” A person of ordinary skilled in the art will appreciate that these limitations together are equivalent to the “variable

blazed grating” limitation claimed in the ‘479 and ‘473 Patents. The interpretation (scope) of the limitation “variable blazed grating” and the limitation “reflective mirror strips” “operable to undergo a partial rotation” “resulting in a diffraction of the input optical signal wherein a majority of the diffracted input signal is communicated in one direction” are discussed below.

**iii) VBG Patents: Interpretation of “Variable Blazed Grating”**

38. The term “grating” is a term of art in the field of optics and optical communications. The VGB Patents do not provide an explicit definition of the term “grating.” However, gratings are one of the most fundamental optical component in the art and have been well known for more than two hundred years.

39. It is my opinion that a person of ordinary skill in the art would interpret the term “grating” in the context of the ‘479 Patent as a “device having a large number of parallel grooves, slits or strips used to produce dispersed optical spectra by diffraction of light.” This construction is consistent with the ordinary and customary usage of the term “grating” in the field of optics and optical communications.<sup>2</sup>

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<sup>2</sup> See, e.g., **Exhibit H**, The American Heritage® Dictionary of the English Language, Fourth Edition (2000) at <http://www.thefreedictionary.com/grating> and <http://www.thefreedictionary.com/diffraction+grating> (“**Grating** . . . 2. A diffraction grating”; “**Diffraction grating**: A usually glass or polished metal surface having a large number of very fine parallel grooves or slits and used to produce optical spectra by diffraction of reflected or transmitted light.”); Collins English Dictionary – Complete and Unabridged © HarperCollins Publishers (2000) at <http://www.thefreedictionary.com/grating> and <http://www.thefreedictionary.com/diffraction+grating> (“**Grating** . . . 2. (Physics / General Physics) short for diffraction grating”; “**Diffraction grating**: (Physics / General Physics) a glass plate or a mirror with a large number of equidistant parallel lines or grooves on its surface. It causes diffraction of transmitted or reflected light, ultraviolet radiation, or X-rays”); McGraw-Hill Dictionary of Scientific & Technical Terms, Sixth Edition (2003) at <http://www.thefreedictionary.com/diffraction+grating> (“**Diffraction grating**: An optical device consisting of an assembly of narrow slits or grooves which produce a large number of beams that can interfere to produce spectra. **Also known as grating.**”); McGraw-Hill Concise Encyclopedia of Physics (2002) at <http://encyclopedia2.thefreedictionary.com/diffraction+grating> (“**Diffraction grating**: An optical device consisting of an assembly of narrow slits or grooves, which by diffracting light produces a large number of beams which can interfere in such a way as to produce spectra. Since the angles at which constructive interference patterns are produced by a **grating** depend on the lengths of the waves being diffracted, the waves of various lengths in a beam of light striking the **grating** will be separated into a number of spectra, produced in various orders of interference on either side of an undeviated central image. . . .”).

40. This interpretation is also consistent with how the term is used in the specification of the VBG Patents. *See, e.g.*, ‘479 Patent, Col. 5:28-56; ‘502 Patent, Col. 5:28-56; ‘473 Patent, Col. 6: 20-48. It is my opinion, after review of the patent, specification, and other intrinsic evidence, that the patents have not defined a special meaning for this term inconsistent with its ordinary and customary usage in the field of optics and optical communications.

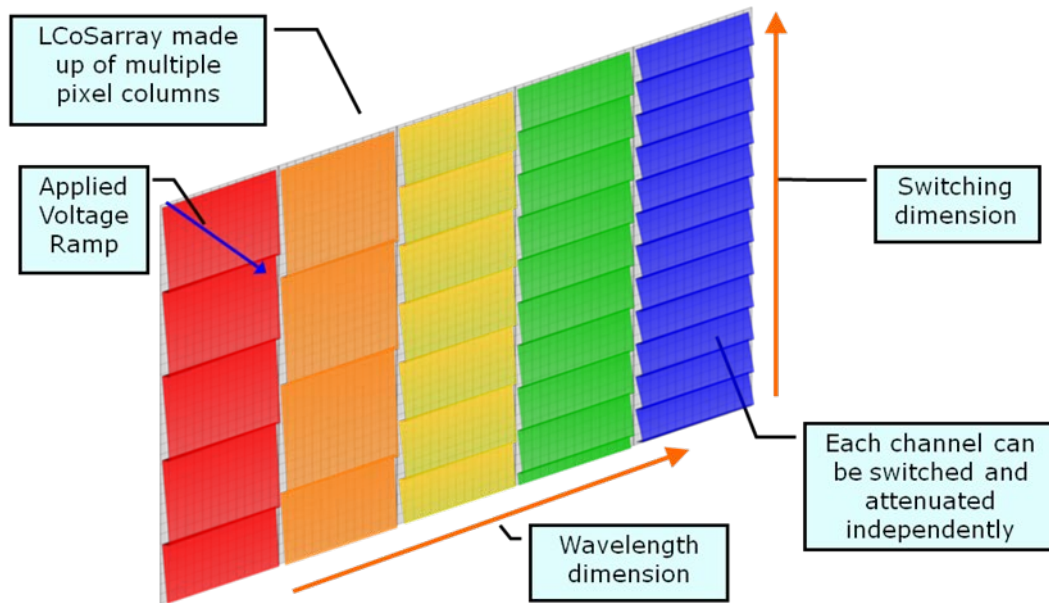
41. The term “blazed grating” refers to a specific type of grating, which is also commonly used in the art. As used in the VBG Patents, the term “blazed” grating refers to a grating that includes “grooves, slits or strips that have been blazed at a blaze angle  $\theta_B$ .” It is my opinion that this construction is consistent with the ordinary and customary usage in the field of optics and optical communications. *See, for example*, **Exhibit I**, Introduction to DWDM Technology by S. V. Kartalopoulos, page 17, which show a schematic diagram of a blazed grating with a blaze angle that is similar to the blazed gratings shown in the ‘479 patent. In particular, see Figs. 6A-6C of the ‘479 Patent, which illustrate “blazed” gratings with blaze angle  $\theta$ .

42. In addition, it is my opinion that the phrase “variable” blazed grating refers to a grating, which can rotate its grooves, slits or strips (i.e. partially reflective mirror strips) to change the blaze angle  $\theta$ . It is my opinion here too that this construction is consistent with the ordinary and customary usage in the field of optics and optical communications and is supported by the specification of the patents. *See, e.g.*, ‘473 Patent, Col. 5:39-43.

**iv) Operation of Finisar’s Accused Wavelength Selective Switch (“WSS”)**

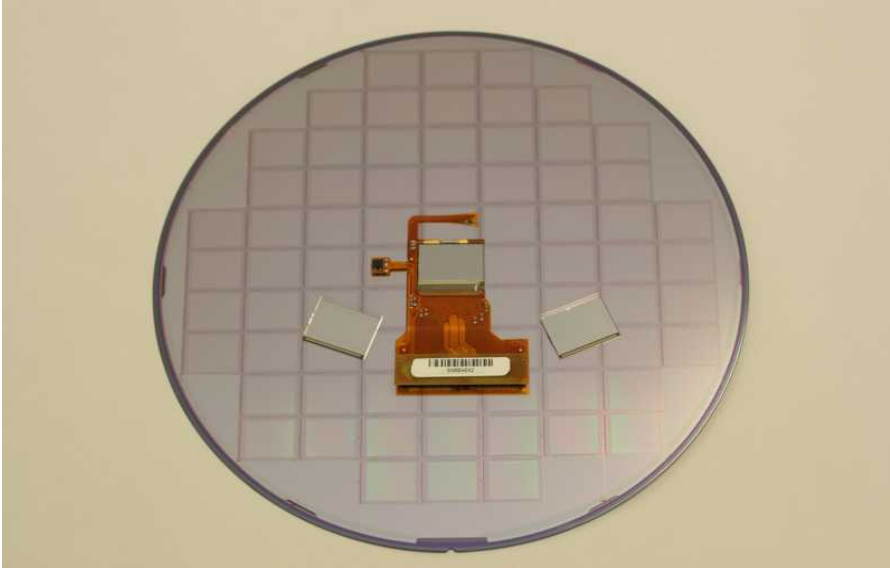
43. I am familiar with the operation of Finisar’s WSS Products based on Finisar’s Accused LCoS Technology. The operation of the Finisar LCoS device can be illustrated visually with the below three-dimensional (“3D”) potential (voltage) diagram. The 3D potential diagram

illustrates the voltage applied to various pixels arranged in columns as a function of distance. The pixels are represented as many small rectangles in each of the columns, but as described herein, there are no physical boundaries defining the pixels. A different voltage ramp is applied to each of the columns. The different voltage ramps impart different phase retardations on light propagating through the associated columns of pixels and these different phase retardations steer the associated optical beams that consists of discrete wavelengths in different directions. In operation, each of the pixel columns steers an optical beam of a particular optical channel (*i.e.*, wavelength or color of light) in a different direction. It is important to note that this 3D diagram illustrates voltage in the Z direction (out of the page). The actual surface of the LCoS device is two dimensional (*i.e.*, flat, much like the liquid crystal display screen of an iPhone). There is no operation of the LCoS device that produces a blazed angle that separates colors of light into a spatially dispersed spectrum. Accordingly, one skilled in the art will appreciate that the Finisar LCoS device is not a “blazed grating” and is not a “variable” blazed grating as taught by the VBG Patents. Instead, the Finisar LCoS device is operating like a set of columns where each entire column operates to steer light received by that column in a particular direction depending on the voltage pattern applied to that column. The periodic resetting of the voltage pattern along a column by  $2\pi$  does not make it the equivalent of a variable blazed grating as taught in the VBG Patents. It is simply an artifact that only a limited voltage range can be applied to the liquid crystal device. Further, it is very clear that the spatial distance between the  $2\pi$  resets is varying and not fixed as in the “variable blazed gratings” taught in the VBG Patents.



**iv) Noninfringement of the VBG Patents by Finisar's Accused Wavelength Selective Switch ("WSS")**

44. Finisar's Accused LCoS Technology does not include a "blazed grating" as required and taught by the asserted claims of the '479 patent. "Blazed gratings" as taught by the VBG Patents have surface profiles that include raised features having specific angles relative to the surface of the grating. Below is an actual picture of a round wafer used to make Finisar LCoS devices (prior to dicing from the round wafer), along with two LCoS cells after dicing (prior to assembly into its mounting package), as well as a completed Finisar WSS LCoS device (after mounting a LCoS cell on an electronic backplane that control the operation of the LCoS device):



The above picture of the Finisar LCoS cells shows that they are flat and do not have surface features with angles relative to the surface of the device. Furthermore, the Finisar LCoS cell/device does not include any moving or “variable” parts like moving MEMs strips that form a “blaze angle” when activated as described in the ‘479 Patent. That is, there is no surface having a large number of very fine “parallel grooves, slits or strips” formed at a blaze angle as required by the VBG Patents that is used to produce dispersed optical spectra by diffraction of reflected or transmitted light.

45. In addition, the function of the Finisar’s Accused LCoS Technology is entirely different from the function of the “variable blazed grating” claimed in the VGB Patents. The function of Finisar’s Accused LCoS Technology is not to form a diffraction pattern or provide any diffraction, but rather to steer beams having a predetermined wavelength in specific predetermined directions. Thus, Finisar’s Accused LCoS Liquid Crystal Technology cannot be considered to include a “variable blazed grating” because it does not include a surface that could be construed as a “blazed grating,” as described and taught by the VBG Patents, and does not include a means to “vary” any grooves, slits or strips to form a “variable” grating as described in

the '479 and '473 Patents. In addition, Finisar's Accused LCoS Liquid Crystal Technology cannot be considered to include a "variable blazed grating" because it is not used to produce disperse optical spectra by diffraction of light (i.e., not used to disperse optical beams according to their wavelength). For the same reasons, the Finisar LCoS device does not include a plurality of at least partially reflective mirror strips, which are operable to undergo a partial rotation and which result in diffraction of the input optical signal wherein a majority of the diffracted input signal is communicated in one direction as required by the '502 Patent. Therefore, the Finisar's Accused LCoS Technology does not infringe any of the VBG Patents.

46. I declare under penalty of perjury of the laws of the United States that the foregoing is true and correct and that the foregoing is executed on February 24, 2012, in Gloucester, Massachusetts.

DATED: FEBRUARY 24, 2012

RESPECTFULLY SUBMITTED,



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ERIC A. SWANSON